Patent claims

Composite Ceramic Body as well as a Process for Producing Such

1. A composite ceramic body, designed in particular for a tribological component such as a brake disk, comprising a fiber-reinforced carbon-containing core area as well as an SiC-containing surface area, wherein
the composite body consists of a fiber-reinforced carbon body, the fibers in the core area are longer than in the surface area, the fibers in the surface area have a lower filament count than in the core area and/or the carbon body in the surface area has a greater porosity than in the core area, and the composite ceramic body contains SiC in such a way that inside the core area, and continuing into the surface area, the SiC proportion changes constantly or essentially constantly.

2. The composite ceramic body of claim 1, wherein
the composite ceramic body is flowingly graded with respect to the SiC proportion such that the core area has ductile properties and the surface area has monolithic SiC layer or Si/SiC layer properties.

3. The composite ceramic body of claim 1, wherein
the carbon body contains additives with different carbon yields for adjusting the porosity.

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4. The composite ceramic body of claim 3, wherein the additives are thermoplastics with different carbon yields.

5. The composite ceramic body of claim 3 or 4, wherein the additives are thermoplastics such as polyethylene or propylene, and/or elastomers such as silicon rubber, and/or duromers such as low cured epoxide resins and natural substances such as sawdust.

6. The composite ceramic body of at least one of claims 3-5, wherein the porosity is adjusted via the grain size distribution of the used additives such as carbons and/or graphites and/or SiC powder and/or Si powder and/or B_4C powder.

7. The composite ceramic body of at least claim 1, wherein the surface area of the composite ceramic body contains between approx. 20% by weight and up to approx. 100% by weight of SiC, between approx. 0% by weight and approx. 30% by weight of free Si, between approx. 0% by weight and approx. 80% by weight of carbon, between approx. 0% by weight and up to approx. 20% by weight of Si_3N_4, and/or between approx. 0% by weight and up to approx. 20% by weight of B_4C.

8. The composite ceramic body of at least claim 1, wherein the core area of the composite ceramic body contains between approx. 0% by weight and up to approx. 20% by weight of SiC, approx. 0% by weight and up to approx. 30% by weight of free Si, between approx. 20% by weight and up to approx. 100% by weight of carbon, and/or approx. 0% by weight and up to approx. 20% by weight of B_4C.

9. A process for producing a fiber-reinforced composite ceramic body, designed in particular for a tribological component such as a brake disk, wherein a fiber-containing carbon body with any optionally desired porosity is made available, the carbon body is infiltrated with silicon and ceramicized by initiating a chemical reaction while forming SiC, wherein prior to the infiltration of the carbon body with Si, said carbon body is structured by various fiber lengths and/or fibers of different filament count and/or selective adjustment of the porosity in such a way that the SiC content of the composite ceramic body increases constantly starting from the interior of the core area and continuing into the surface area.

10. The process of claim 9, wherein fibers of a greater length are used in the core area than in the surface area.

11. The process of claim 9, wherein fibers with a lower filament count are used in the surface area than in the core area.

12. The process of claim 9, wherein the porosity is adjusted with additives having different carbon yields.

13. The process of claim 9 or 12, wherein additives having a lower carbon yield than those in the core area are used in the surface area.

14. The process of at least one of claims 9, 12 or 13, wherein the porosity is adjusted according to the grain size distribution of the additives.

15. The process of at least one of claims 9, 12, 13 or 14, wherein thermoplastics such as polyethylene or propylene, and/or elastomers such as silicon rubber, and/or duromers such as low cured epoxide resins, and/or natural substances such as sawdust are used as additives.

16. The process of at least one of claims 9, 12, 13, 14 or 15, wherein those additives with different grain size distribution, such as carbons and/or graphites and/or SiC powder and/or Si powder and/or B_4 C are used.

17. The process of at least one of claims 9 to 16 for producing a tribological component, particularly in the form of a clutch disk, wherein a fabric consisting of individual layers is used, outer layers are coated with a spray coating of a powder of a renewable raw material such as wood and a binding agent, subsequent fabric layers are correspondingly spray-coated, in which the proportion in weight of the materials applied by spray coating from jointly spray-coated fabric layers decreases from the outside toward the inside.

18. The process of claim 17, wherein the layers produced obtained by spray coating in accordance with the grading procedure are placed in a mold such as an RTM die, infiltrated with a resin, and then hardened.

19. The process of claim 17 or 18, wherein

after the hardening takes place a carbonization, and then a processing, and finally a silicizing.

20. The process of at least one of claims 9 to 20, wherein

one or several preforms are used to produce the composite ceramic body.